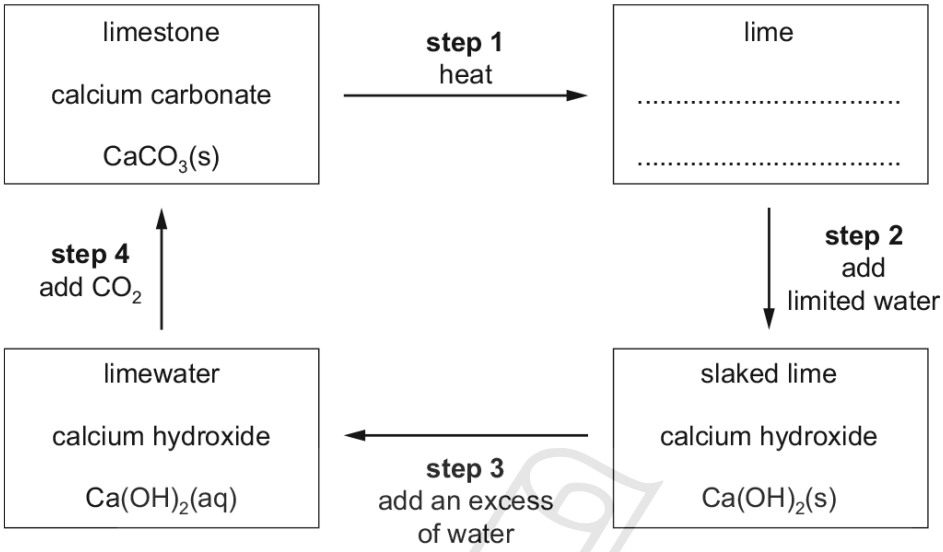
7.1 Physical and chemical changes

01. 0620_m18_qp_42 Q: 3

Limestone rock is mainly calcium carbonate, $CaCO_3$.

(a) The 'limestone cycle' is shown. Each step is numbered.



(i) Complete the box to give the chemical name and formula of lime. [2]

(ii) Which step involves a physical change?

..... [1]

(iii) What type of reaction is **step 1**?

..... [1]

(iv) Suggest how **step 2** could be reversed.

..... [1]

(v) Write a chemical equation for **step 4**.

..... [1]

(vi) Explain why **step 4** is a neutralisation reaction. Refer to the substances reacting in your answer.

.....

..... [2]

(b) Dolomite is a similar rock to limestone. Dolomite contains magnesium carbonate, $MgCO_3$.

Write a chemical equation for the reaction between magnesium carbonate and dilute nitric acid.

..... [2]

(c) Forsterite is another rock which contains a magnesium compound.

A sample of forsterite has the following composition by mass: Mg, 2.73 g; Si, 1.58 g; O, 3.60 g.

Calculate the empirical formula of forsterite.

empirical formula = ... [2]

[Total: 12]

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(a)(i)	M1 calcium oxide M2 CaO	**2**
(a)(ii)	(step) **3**	**1**
(a)(iii)	thermal decomposition	**1**
(a)(iv)	heating	**1**
(a)(v)	$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$	**1**
(a)(vi)	M1 CO_2 is acidic M2 $Ca(OH)_2$ is a base / alkali	**2**
(b)	$MgCO_3 + 2HNO_3 \rightarrow Mg(NO_3)_2 + H_2O + CO_2$ M1 $Mg(NO_3)_2$ M2 rest of equation	**2**

(c)		Mg	Si	O	**2**
	M1	2.73 / 24	1.58 / 28	3.60 / 16	
	OR	0.11375	0.0564	0.23(0)	
	M2	0.0.11375 / .0564	0.0564 / .0564	0.230 / .0564	leading to Mg_2SiO_4